REMARKS

This Amendment is submitted in response to the Office Action mailed on September 30, 2005. Claims 1 - 9 are pending, with claims 7 - 9 being allowed, claims 2 and 6 allowable if re-written, and claims 1 and 3 - 5 standing rejected at present.

Claims 2 and 6 have been re-written.

An amendment to claim 4 corrects an obvious typographical error.

Claim 3 has been amended to remove the possibility of interpreting paragraph (a) as setting forth an intended use. The PTO commonly refuses to give patentable weight to statements of intended use.

Claims 10 - 15 are added. A charge slip is enclosed, to cover the cost of the added independent claims.

re: DOUBLE PATENTING

Applicants acknowledge the double-patenting rejection, and will file a terminal disclaimer at the proper time, if required.

RESPONSE TO OBVIOUSNESS REJECTIONS

Claim 3

Claim 3 was rejected as obvious, based on Klimstra and admitted prior art. However, Applicants submit that several

problems are present in the rejection.

Problem 1

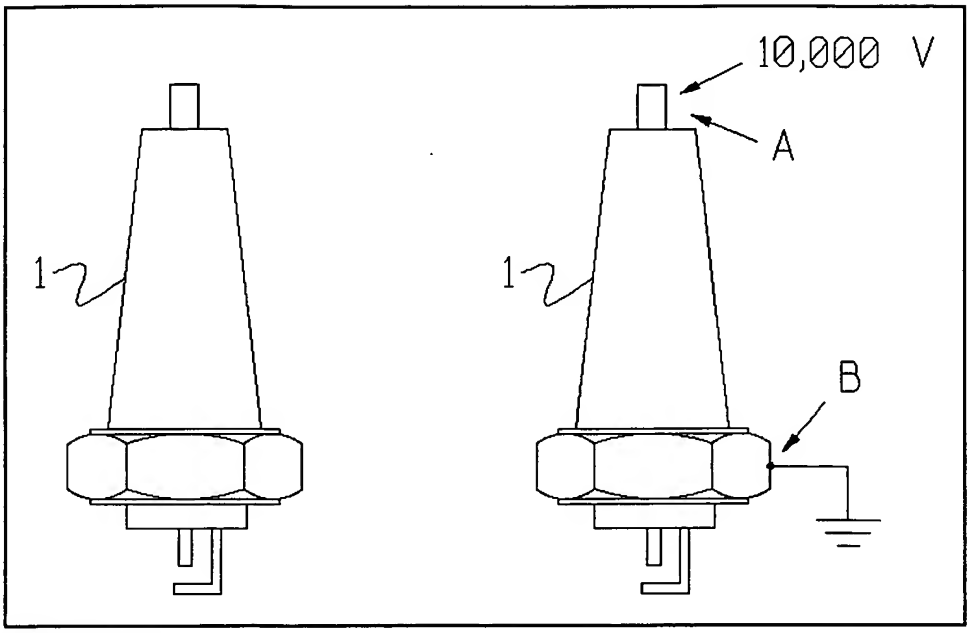
Even if the references are combined, claim 3 is not attained. Claims 3 recites "a coil **adjacent a housing** of the igniter." Klimstra's coil 8 in his Figure 1 is not adjacent a housing of his spark plug. Klimstra states that the coil 8 surrounds a "single wire lead." (Column 6, lines 22 - 24; lines 42 - 43.)

His coil 8 surrounds a plug wire.

His coil 8 is not "adjacent a housing of the igniter" as claimed. Thus, even if the references are combined, claim 3 is not attained.

Problem 2

Good engineering practice militates against placement of Klimstra's coil 8 around his spark plug. Sketch 1, below, on its left side, contains a rendition of Klimstra's spark plug.

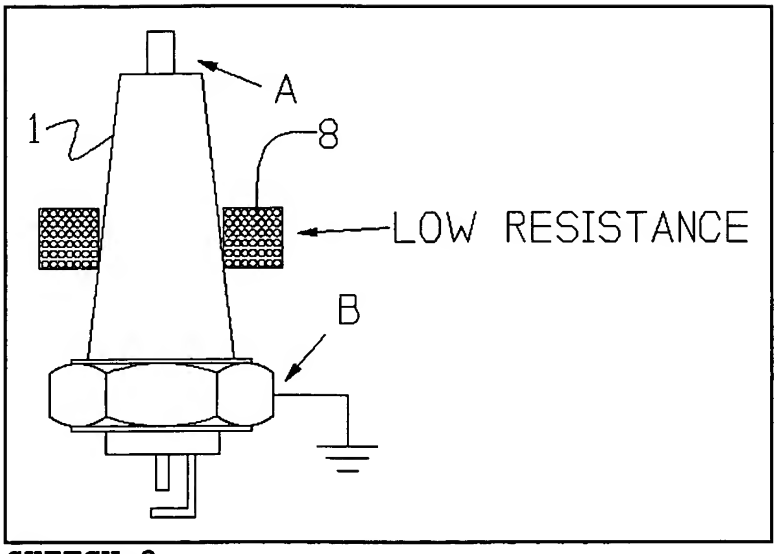


SKETCH 1

Sketch 1, right side, shows annotations added to the spark plug.

Plainly, element 1 is a ceramic insulator, which separates the high-voltage terminal A from the grounded base B.

If Klimstra's coil 8 is placed around the insulator, as in Sketch 2, below, then the resistance of the path between points A and B will probably be reduced.



SKETCH 2

This is easy to explain. Prior to placement of the coil against the insulator, only air extended between points A and B alongside the insulator. After placement of the coil against the insulator, air is present between point A and the coil, and between point B and the coil.

However, the coil, being packed with metallic wires, indicated by the circles, is a low-resistance body. The total resistance between points A and B is now reduced. Arc-over may occur between point A and the coil, or between point A, the coil, and then point B.

This type of arcing, called flashover, occurs on insulators used in electric power distribution. For example, volcanic ash deposited on insulators can cause flashover. (See

www.volcanoes.usgs.gov/ash/power/)

Therefore, until an analysis is made of whether the coil 8 will cause flashover, no designer will place the coil 8 around Klimstra's spark plug. Thus, again, even if the references are combined, claim 3 is not attained.

In addition, an analysis of heat dissipation must also be made. The spark plug gets hot in operation, and must radiate heat, in order to maintain the proper temperature. The coil 8 may act as a thermal insulator, and block heat flow. The coil 8 may raise the temperature of the spark plug to a dangerous level. Again an analysis is necessary, to determine whether the presence of the coil 8 can be tolerated.

Problem 3

Applicants point out that the igniter in a gas turbine engine is located in an extremely hot environment. (See paragraph 103 et seq. of the Specification.)

Applicants submit that the substitution of the spark plug of Klimstra into a gas turbine engine is thus incomplete.

The plug wire 4 of Klimstra is plainly not designed to withstand such high temperatures. Consequently, the PTO must provide a teaching which supplies a high-temperature cable which replaces the plug wire 4.

Problem 4

No teaching has been given for substituting Klimstra's spark plug into the prior-art gas turbine engine.

Applicants point out that the prior-art gas turbine engine is already equipped with an igniter 12 in Figure 1 of the Specification.

The PTO has provided no line-of-reasoning as to why Klimstra's spark plug should replace that igniter 12.

MPEP § 706.02(j) states:

> Contents of a 35 U.S.C. 103 Rejection
>
> . . . the examiner should set forth in the Office action:
>
> . . .
>
> (C) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter, and
>
> (D) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification.
>
> To establish a prima facie case of obviousness, three basic criteria must be met.
>
> First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings.
>
> . . .

> Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
>
> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

The "motivation" for modifying the references, as required by this MPEP section, has not been given.

Problem 5

Applicants respectfully submit that the rationale used by the PTO is defective.

POINT 1

In essence, the rationale is that

1) all elements of claim 3 are found in the prior art

so that

2) it is obvious "to employ the coil sensor of Klimstra in a gas turbine engine to detect the presence of spark." (Office Action, page 3, section 6.)

However, that is not a rationale allowed by section 103.

That is nothing more than an unsupported conclusion of obviousness.

Also, the mere presence of all claim elements within the prior art, by itself, is not a justification for assembling some of the elements into a claimed invention, under the rules of obviousness.

In fact, the MPEP specifically prohibits such an assembly. MPEP § 2143.01 states:

> FACT THAT REFERENCES **CAN BE** COMBINED OR MODIFIED IS NOT SUFFICIENT TO ESTABLISH PRIMA FACIE OBVIOUSNESS
>
> The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.
>
> . . .
>
> FACT THAT THE CLAIMED INVENTION IS **WITHIN THE CAPABILITIES OF ONE OF ORDINARY SKILL IN THE ART** IS NOT SUFFICIENT BY ITSELF TO ESTABLISH PRIMA FACIE OBVIOUSNESS
>
> A statement that modifications of the prior art to meet the claimed invention would have been "well within the ordinary skill of the art at the time the claimed invention was made" because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a prima facie case of obviousness without some objective reason to combine the teachings of the references.

POINT 2

In essence, the Office Action asserts that (1) the difference between the admitted prior art and the claims is the absence of the sensor and (2) addition of the sensor is obvious.

However, Applicants submit that this type of reasoning does not comply with the MPEP. MPEP § 2141.02 states:

> In determining the differences between the prior art and the claims, the question under 35 USC 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious.

The Office Action has not shown that the combination of references **as a whole** is obvious. The Office Action has only asserted that addition of Klimstra's coil is obvious. The latter assertion does not comply with the MPEP section cited immediately above.

Problem 6

Applicants submit that the rationale is defective for another reason. The rationale does not lead, as a matter of logic, to claim 3.

There is no suggestion in the applied references that the coil should be **adjacent** a housing of the igniter. Thus, there is no basis for placing Klimstra's coil 8 adjacent such a housing, as claimed.

From another perspective, even if you combine the references, you would follow Klimstra's teaching. That teaching is to place the coil 8 around a wire, not adjacent a housing.

Problem 7

The Office Action, in essence, is treating Klimstra's spark plug as an "equivalent" to an igniter in a gas turbine engine. Thus, the substitution of Klimstra's spark plug into the gas turbine engine is plainly based on the notion of substitution-of-equivalents.

But MPEP § 2144.06 states:

> In order to rely on equivalence as a rationale supporting an obviousness rejection, **the equivalency must be recognized in the prior art**, and cannot be based on . . . the mere fact that the components at issue are functional or mechanical equivalents.

No recognition in the prior art has been shown.

Further, such recognition would be impossible. The "spark" produced by Klimstra's spark plug is the size of a human hair, and spans the spark gap d in his Figure 1. That spark gap is about 0.040 inch long.

The gap in a gas turbine engine igniter is about ten times that length. A much larger voltage is required (to break down the larger amount of air in the gap), and to produce a much larger plasma. The larger plasma is required because jet fuel (ie, kerosene) is much more difficult to ignite than gasoline.

A video of a gas turbine igniter in operation is available at

www.unisonindustries.com/corporate/history/innovation.html

The video clearly indicates that a gas turbine igniter produces a significantly larger plasma, than the hair-like plasma of Klimstra's spark plug.

Therefore,

-- Klimstra's spark plug is a fundamentally different device than is a gas turbine igniter,

-- no recognition of equivalence between the two devices has been shown in the prior art, and

-- such equivalence does not exist.

Conclusion as to Claim 3

Applicants submit that the rejection is insufficient under section 103.

Claim 1

Claim 1 recites:

> 1. A method of detecting spark in an igniter in a gas turbine engine, comprising:
>
> a) providing a transformer having

i) a primary which carries igniter current and

ii) a secondary of inductance L;

b) connecting the secondary in series with a resistance R and capacitance C; and

c) inferring presence of spark by detecting signals in capacitance C.

Applicants respectfully point out several apparent problems in the rejection.

Problem 1

POINT 1

The Office Action, page 4, asserts that passive amplification RLC circuits are known in the art. However, Applicants point out that this assertion is incomplete.

The Specification, paragraph 107, points out that the prior art requires **specific conditions** for amplification. Those conditions are **sinusoidal steady-state operation**. That is, constant frequency, and sinusoidal voltage are required.

It is Applicants, not the prior art, who have discovered that amplification also occurs to the non-sinusoidal pulses in the claimed igniter.

No teaching has been given for applying the prior-art RLC amplifier to the non-sinusoidal, non-steady-state condition, which

occurs in the claimed igniter.

POINT 2

It could be argued that the claim does not state that the sinusoidal steady state is absent. However, that is not relevant.

The question is whether the "skilled person" would combine the RLC amplifier with the admitted igniter system. Applicants submit that the skilled person would not, because the Specification, in describing the admitted igniter system, states that it is powered by pulses, not by sinusoidal steady state current. For example, paragraph 0005 states that the igniter is "repeatedly sparked." It is well known that this repetition is caused by a sequence of voltage pulses, not sinusoidal waveforms.

Therefore, the skilled person, in viewing the admitted art, sees sparking induced by a pulse train of voltage spikes. The skilled person has no motivation to combine the cited RLC amplifier, which requires sinusoidal steady state operation. And the PTO has provided no motivation.

POINT 3

This can be viewed as an "obvious to try" situation. (See MPEP § 2145, section X.) In simple terms, the "obvious to try" rule states that, even if it is "obvious" to try an approach, if an inventor does make the trial, and the trial works, then the

inventor is entitled to claim the successful trial.

Thus, Applicants submit that the Office Action is actually rejecting the claim on the grounds that it is obvious to try the RLC amplifier in the admitted art. That type of rejection is not allowed.

Problem 2

The combination of references re-designs Klimstra, and renders him unfit for his intended purpose. MPEP § 2143.01 prohibits this:

> THE PROPOSED MODIFICATION CANNOT RENDER THE PRIOR ART UNSATISFACTORY FOR ITS INTENDED PURPOSE.
> . . .
> THE PROPOSED MODIFICATION CANNOT CHANGE THE PRINCIPLE OF OPERATION OF A REFERENCE.

While the Office Action does not explicitly state how Klimstra's Figure 1 is modified, the Office Action does imply that the RLC amplification replaces "an active amplification circuit."

Thus, the Office Action replaces Klimstra's amplifier 11.

However, Klimstra states that this amplifier 11 is adjustable as to gain, and he wants that adjustment for specific purposes. (Column 6, lines 47 - 56.)

The PTO has not shown how the replacement RLC amplifier provides the adjustable gain.

Therefore, the modification of Klimstra renders him unfit for

his intended purpose, contrary to the MPEP section just cited.

Problem 3

The amplifier in Klimstra is a DC amplifier. It amplifies a DC signal. An RLC amplifier cannot amplify a DC signal. Thus, the combination of references is inoperative. MPEP § 706.02(j) states:

> Contents of a 35 U.S.C. 103 Rejection
>
> . . .
>
> To establish a prima facie case of obviousness, three basic criteria must be met.
>
> . . .
>
> Second, there must be **a reasonable expectation of success**.
>
> . . .
>
> The . . . reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

This will be explained.

Klimstra's goal is to measure the voltage at which spark occurs. He states that this voltage indicates the length of the spark gap d in his Figure 1. (Column 4, lines 16 - 18.)

To this end, he derives a signal which he says indicates the "average instantaneous peak value of the detector signal." (Column 4, lines 62, 63.) The "detector" is his coil 8. He states elsewhere that this detector signal is accurately correlated with

the voltage at the spark gap d in his Figure 1. (Column 8, lines 43 - 45.)

This average signal is applied to his amplifier 11.

However, this average signal is plainly a DC signal. This conclusion is consistent with Klimstra's statement that the output of the amplifier 11 is applied to a "voltmeter or LED display." (Column 6, lines 54, 55.) Clearly, the "voltmeter or LED display" will display a DC voltage, or one which is slowly varying, so that a human observer can read the voltage.

This conclusion is also consistent with Klimstra's goal: to determine the voltage applied to the spark gap when spark occurs. That voltage is a **constant**, a number. The voltage applied to amplifier 11 indicates that number.

This conclusion is further consistent with the fact that Klimstra, bottom of column 6, states that his amplifier 11 produces outputs at "levels" which are compared with reference "levels." Plainly, his amplifier produces a DC signal, at a "level," which is the average of the voltages produced by coil 8.

Therefore, it is concluded that Klimstra's amplifier receives a DC signal.

An RLC amplifier will not amplify the DC signal of Klimstra.

Therefore, Applicants submit that substitution of the RLC amplifier into Klimstra renders Klimstra inoperative. Consequently, no expectation of success has been shown. Also, you

would not apply a DC current to the inductor in the RLC circuit.

Problem 4

Klimstra's amplifier 11 must have constant gain over the range of inputs, which is sometimes called "linearity." That is, if the input voltage is Vin, the output is K x Vin, wherein K is the gain. To repeat, if the input is 2 volts, the output is 2xK volts. If the input is 10 volts, the output is 10xK volts.

This constant gain is required because the spark gap may break down at 5,000, or at 10,000 volts (for example). The output of the amplifier 11 must indicate that breakdown voltage.

If the gain is not linear (ie, a constant K at either the 5,000 volts or 10,000 volts in this example), then the output of the amplifier will not indicate the breakdown voltage.

The RLC amplifier, when used in Applicants' invention, produces a ringing, decaying waveform as indicated in Figures 30 - 35 of the Specification.

Applicants submit that the PTO must explain either

-- how such a waveform can be used in Klimstra's Figure 1, to indicate breakdown voltage

or

-- if such a waveform is not produced when the RLC amplifier is substituted into

Klimstra, what the RLC amplifier does produce, and how that indicates breakdown voltage.

Problem 5

Applicants point out a primary difference between Klimstra and the claimed invention.

The claimed invention intends to detect the **presence** of a plasma.

Klimstra intends to measure the **size of the voltage producing a spark**.

Thus, it should not be surprising that the invention cannot be assembled from Klimstra's components. Klimstra and the invention perform fundamentally different tasks.

Problem 6

The PTO's motivation for the modification of Klimstra is to "eliminate the power required by an active amplification circuit." However, the remaining elements in Klimstra's Figure 1 still consume power. Any saving is insignificant.

Applicants point out that Klimstra's Figure 1 shows over ten elements which consume power. Assuming that all ten elements consume power equally, elimination of the power-consuming amplifier will save ten percent in power. Applicants submit that such a saving would not be pursued by a designer unless, for example, the

apparatus were being designed for a trip to Mars, where power consumption must be absolutely reduced to the lowest possible level, and that has not been shown.

Further, the amplifier which is eliminated probably consumes power measured in the milliwatt range. Klimstra shows other elements which clearly consume dozens, if not hundreds, of watts each. For example, he discusses a "pen recorder" (column 6, line 58) and a modem 17. And he states that a "personal computer" can perform analysis. (Column 7, line 12.)

The undersigned attorney owns a Hewlett Packard model 7550A pen plotter, which can be used as a "pen recorder." The nameplate states that it consumes "105 watts max."

The modem beneath the undersigned attorney's desk is powered by a wall transformer which is rated at about 5 watts.

It is well known that a PC consumes a few hundred watts.

Therefore, given the fact that Klimstra's system consumes so much electrical power, Applicants submit that pursuit of saving of a few milliwatts does not amount to a teaching to replace his amplifier by an RLC amplifier, for the purpose of saving power. Any saving in power is insignificant.

Thus, no motivation for replacing Klimstra's amplifier 11 has been shown.

Problem 7

Amplifier 11 in Klimstra's Figure 1 clearly amplifies power. Not only is voltage amplified, as Klimstra states, but current must also be added, because of the fan-out, ie, the large number of devices to which this current is delivered. The power delivered by the amplifier is the output voltage of the amplifier, Vout, multiplied by the current delivered.

Another reason supporting this conclusion is that amplifiers, in general, are designed to have a very high input impedance, in order to avoid loading the preceding stage (integrator 10 in this case). With a high input impedance, the applied voltage to the amplifier causes the amplifier to draw **very little current**, and ideally zero current.

Since power equals voltage x current, and current drawn is very small, and approaching zero, power drawn is very small.

Thus, again, since power drawn from the integrator 10 is small (and theoretically zero), amplifier 11 must amplify that power, to feed the downstream stages.

Stating the preceding more simply, if Klimstra's amplifier 11 does not amplify power, what is it doing ? If it amplifies voltage, but keeps output current equal to input current (though small), then it still amplifies power.

If the PTO wishes to assert that his amplifier amplifies voltage, but reduces current (like a transformer) to keep power constant, Applicants request a citation of authority showing such

an amplifier.

Therefore, Applicants submit that Klimstra's amplifier 11 must amplify power.

The Specification, paragraph 105 et seq., explains that an RLC amplifier does not amplify power.

Consequently, if an RLC amplifier replaces Klimstra's amplifier 11, Klimstra is rendered inoperative.

That is not allowed.

Problem 8

The PTO is using Applicants' own Specification as a teaching.

POINT 1

The Specification, paragraph 107 et seq., set forth the conditions known in the prior art, under which an RLC amplifier works, namely,

> 1) the signal source is constant frequency and also sinusoidal
>
> and
>
> 2) the values of L and C are chosen so that the input impedance is purely real (as opposed to imaginary). Condition (2) is commonly called resonance.

Applicants have discovered that an RLC amplifier can still

work in certain situations where these conditions do not apply.

But that is Applicants' discovery. That has not been shown in the prior art.

Klimstra does not show the two conditions just stated. Also, as explained above, his amplifier receives a DC signal, not a sinusoidal signal.

POINT 2

The frequency of Klimstra's spark-signal is not constant. It changes as engine speed changes. (In contrast, Applicants' igniter frequency is constant, and is determined by the exciting circuit.) As explained in the Specification, the amplification is maximal at a single frequency. Applicants submit that the PTO is required to explain why Klimstra would want the reduction, or roll-off, in amplification which occurs at engine speeds other than that which produces the maximal amplification.

POINT 3

This modification makes Klimstra inoperative. As just explained, the gain of the RLC amplifier is frequency-dependent. (See Figures 24 - 34 of Applicants' Specification, and the accompanying text.) Thus, if the RLC amplifier is substituted into Klimstra (and assuming that the system works, which Applicants do not admit), Klimstra's system will detect different breakdown

voltages at different engine speeds.

That is, it may be assumed that spark is produced at a fixed voltage. But, at one engine speed, the RLC amplifier will amplify that voltage to a certain level. (Not really: the RLC amplifier will not amplify DC signals, as explained above.)

At another engine speed, the RLC amplifier will amplify that (same) voltage to **another level**.

Thus, the voltage which Klimstra's apparatus indicates as the breakdown voltage of the spark gap d in his Figure 1 will depend on engine speed, that is, on the frequency of the sparking.

Klimstra is therefore rendered inoperative.

POINT 4

The requirement that the RLC circuit be resonant cannot be attained in Klimstra, even assuming that Klimstra is sinusoidal.

Frequency, as just explained, is not constant in Klimstra: frequency of spark changes, as engine speed changes. But the "L" and the "C" needed for resonance depend on the frequency at which resonance is sought.

Restated, different values of "L" and "C" are needed for resonance at different frequencies. Spark frequency is different at different engine speeds. "L" and "C" will have one set of values at frequency F1, and a different set of values at F2, and so on.

Therefore, the prior art teaches against using an RLC amplifier in Klimstra. The conditions required for such an amplifier are not present.

Consequently, the PTO's substitution of an RLC amplifier into Klimstra is clearly motivated by Applicants' own Specification, since (1) no motivation has been shown in the prior art and (2) the conditions required by the prior art are not present in Klimstra.

The preceding applies to claims 3 and 5.

ADDED CLAIMS

Claim 10 states that the housing is conductive. No such housing is found in Klimstra.

Nor is such a housing possible. The surface of insulator 1 must be an insulator. No conductive surface can be present near the electrode (not shown in Klimstra) to which the wire 4 connects, because of the high voltage on wire 4.

This applies to claims 11 and 12.

Also, claim 12 states that the housing acts as a protective shield. That is not found in Klimstra.

Claim 13 states, in simple terms, that a net current is present inside the shield, which creates a net magnetic field, which is detectable. If all current which forms the spark returned

through the shield, no net current would be present.

Claims 14 and 15 state that the capacitor C produces a decaying oscillating signal. Figures 30 - 35 of the Specification provide examples. If an RLC amplifier is substituted for Klimstra's amplifier 11, and if the capacitor in that amplifier produces decaying oscillating signals, then Klimstra is rendered inoperative.

CONCLUSION

Applicant requests that the rejections to the claims be reconsidered and withdrawn.

Applicant expresses thanks to the Examiner for the careful consideration given to this case.

Respectfully submitted,

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